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Postscriptum.

Dr. W. T. Calman has kindly drawn my attention to a memoir in the 'Bollettino della Società di Naturalisti in Napoli' (vol. xxiv. ser. ii. vol. iv. anno xxiv.), published in 1911, and entitled "Contributo allo Studio dei Mallofagi, Observazione sul *Menopon pallidum*." This paper unfortunately arrived in this country too late for consideration. The author, Euclide Armenante, investigates *M. pallidum* and finds that the "glands" and "ducts" are, as I suppose, chitinous. The hypopharynx is not typical in this species, but lends support to the homologies indicated above, and appears to stand somewhere between *Læmobothrium* and such forms as *Trinoton*, *Nitzschia*, etc.

11. Report on the Deaths which occurred in the Zoological Gardens during 1912, together with the Blood-Parasites found during the Year. By H. G. Plimmer, F.R.S., F.Z.S., Pathologist to the Society.

[Received and Read February 4, 1913.]

On January 1st, 1912, there were 885 mammals, 2180 birds, and 518 reptiles in the Zoological Gardens; and during the year 506 mammals, 1346 birds, and 648 reptiles were admitted, making a total for the year of 1391 mammals, 3526 birds, and 1166 reptiles.

During 1912, 375 mammals, 817 birds, and 347 reptiles have died: that is, a percentage of 26·9 for mammals, 23·2 for birds, and 29·8 for reptiles.

633 deaths out of the total of 1539 for the year occurred in animals which had not been six months in the Gardens. It has been found that after six months' residence in the Gardens the percentage falls rapidly, so that it is assumed that by that time the new animals have got over their journeys, or have died from any diseases they may have brought with them, or have got quite

used to their new environment. 144 of these 633 were mammals, 317 were birds, and 172 were reptiles; and if these be deducted from the above the percentage appears as 16·6 for mammals, 14·2 for birds, and 15 for reptiles.

The following tables show some of the facts ascertained in outline. Table I. summarizes the actual causes of death in the three groups specified. Under Reptiles are included Amphibia.

TABLE I.—Analysis of the Causes of Death.

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
1. *Microbic or Parasitic Diseases.*				
Tuberculosis	14	79	11	1
Mycosis	12	72	2	2
Pneumonia	45	98	124	3
Septicæmia	2	...	...	
Pericarditis	5	1	...	
Stomatitis	...	...	4	
Peritonitis	7	...	...	
Abscess	1	...	1	
Empyema	1	...	...	
Hydatids	4	...	...	
Worms	4	...	1	4
Dermatitis (sarcoptic)	1	...	...	
2. *Diseases of Respiratory Organs.*				
Bronchitis	12	...	...	
Broncho-pneumonia	30	...	...	
Congestion of lungs	14	108	22	
Atelectasis	2	...	...	
3. *Diseases of the Heart and Vessels.*				
Aneurism	...	1	...	5
4. *Diseases of the Liver.*				
Fatty degeneration	1	7	...	
Hepatitis	...	14	...	
5. *Diseases of the Alimentary Tract.*				
Gastritis	...	1	...	6
Gastric ulceration	8	...	...	
Gastro-enteritis	11	1	3	7
Enteritis	38	154	25	7
Intestinal obstruction	1	...	...	
6. *Diseases of Urinary and Generative Organs.*				
Nephritis	89	104	9	8
Cystic kidneys	1	...	...	9
Stone	1	...	...	
Inflamed oviduct	...	1	...	
Sloughing uterus	1	...	...	
7. *Various.*				
Carcinoma	4	...	...	10
Sarcoma	2	1	2	11
Senile Decay	...	1	...	
Injuries discovered *post-mortem*	5	8	1	

Besides those tabulated above,

59 mammals, 100 birds, 2 reptiles, were killed by order or by companions,
3 „ 3 „ 94 „ died from malnutrition or starvation,
6 „ 32 „ 70 „ were too stale for detailed examination,

these completing the total.

In Table I. the classification is made of those diseases which actually caused death. Table II. summarizes the other diseases from which the animals were suffering; and if this Table be taken in conjunction with Table I., a much more accurate estimate of the amount of disease in the Gardens will be arrived at.

TABLE II.—Other Diseases found in the animals tabulated in Table I.

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
Tuberculosis	4	6	6	
Mycosis	1	2	...	
Pneumonia	3	10	3	
Pericarditis	4	10	...	
Peritonitis	5	...	...	
Pleuritis	1	...	...	
Malaria	...	37	...	12
Filaria	4	30	1	13
Worms	3	2	...	
Hæmogregarines	...	...	32	14
Trypanosomes	...	11	...	15
Stomatitis	...	...	4	
Abscess	9	...	1	
Coccidiosis	2	...	...	
Bronchitis	8	...	...	
Broncho-pneumonia	12	...	...	
Congestion of lungs	34	63	10	
Œdema of lungs	1	42	21	
Dilated heart	5	3	...	
Atheroma	7	1	...	
Fatty liver	20	50	11	
Hepatitis	...	3	2	
Cirrhosis of liver	2	...	...	
Gastritis	1	...	1	
Gastric ulceration	18	...	...	
Gastro-enteritis	3	...	4	
Enteritis	34	62	20	
Intussusception	3	1	...	
Intestinal obstruction	2	1	...	
Nephritis	52	44	4	
Cystitis	2	...	...	
Inflamed oviduct	...	5	...	
Rickets	17	1	...	
Arthritis	...	1	...	
Chylous ascites	1	...	...	

Table III. shows, in still further detail, the distribution of diseases amongst the various orders of mammals.

Table III.—Showing the Distribution of Diseases causing Death amongst the principal Orders of Mammals.

Diseases.	Primates.	Carnivora.	Rodentia.	Ungulata.	Edentata.	Marsupialia.
Tuberculosis	5	6	2	1	...	...
Mycosis	2	...	...	...	...	10
Pneumonia	8	15	10	4	5	3
Septicæmia	...	1	...	1	...	...
Abscess	...	...	...	1	...	...
Pericarditis	2	1	...	1	...	1
Peritonitis	...	5	1	...	...	1
Empyema	...	1	...	...	...	...
Dermatitis (sarcoptic)	...	...	...	1	...	...
Hydatids	1	...	...	3	...	...
Worms	...	2	...	...	1	...
Bronchitis	6	1	3	1	1	...
Broncho-pneumonia	11	7	1	9	...	2
Congestion of lungs	7	1	6	...	...	...
Atelectasis	...	...	...	2	...	...
Fatty degeneration of liver	...	...	...	...	...	1
Gastritis	...	...	...	1	...	...
Gastro-enteritis	1	7	2	2	...	...
Gastric ulceration	3	1	2	2	...	...
Enteritis	12	11	7	5	3	...
Intestinal obstruction	...	...	...	...	...	1
Nephritis	24	31	15	13	2	4
Cystic kidneys	...	...	...	1	...	...
Stone	...	...	...	1	...	...
Cancer	...	...	...	3	...	1
Sarcoma	...	2	...	...	...	...

Notes on the foregoing Tables.

1. There has been a general decrease in the deaths from tubercle during the past five years, which has been most marked in mammals. In 1908, 59 mammals died from tubercle, last year only 14. The percentage of deaths of the total number of animals is 1 per cent. for mammals, 2·2 for birds, and 1 for reptiles. Of the 14 mammals, 9 had not been six months in the Gardens; and 9 were pet animals which had been presented, 1 shared burrows in the squirrel's enclosure with the rats (which we know are infected), 1 had been in captivity in the East for some months before reaching London, and 1 was a tame animal which had been reared by hand. So that only 2 of the old mammal inhabitants died last year from tubercle.

Of the bird cases, 52 were generalised tubercle, and 6 were of bovine type.

2. All the mould-diseases have been grouped under mycosis. Ten of the mammal cases were in Wallabies, and of the same type as that I have previously described, affecting primarily the jaws; the other 2 were in Cercopitheques in which the infection was localised in the intestines and kidneys. There is a slight decrease in the number of deaths from mycosis in birds, but it is still large, and is 2 per cent. of the total number of birds.

3. There is an increase in the deaths from pneumonia in birds and reptiles. The percentage on the total number of animals is 3·2 for mammals, 2·7 for birds, and 10 for reptiles. It is amongst the reptiles that the increase has been most marked, from 4 in 1908 to 120 in 1912 (these are pneumococcal cases and do not include those due to irritation from worms' eggs and embryos).

4. "Worms" is used in a comprehensive sense; two of the mammals were Indian Buffaloes with an enormous trematode infection of the stomach.

5. This was a ruptured aneurism of the ascending aorta in a Pigeon.

6. In a Duck, after swallowing wire.

7. The percentage of gastro-enteritis is still high: 3·5 for mammals, 4·3 for birds, and 2·4 for reptiles, on the total number of each. It has been noticed during the last year in connection with enteritis in mammals that there has often been an associated condition of gingivitis, not bad enough to call pyorrhœa, which possibly may stand in causal relationship to the enteritis. In 2 mammals it was of coccidial origin, and in 2 others it was due to worms. Of the bird cases 72 were hæmorrhagic and 9 were due to foreign bodies. It has much decreased amongst the reptiles, and 6 of the cases in this class were due to worms.

8. Nephritis has increased amongst mammals and birds, having caused the deaths of 6·4 per cent. in the former and 2·9 in the latter. Of the cases in mammals 60 were acute, 10 in condition of "large white" kidney, and 19 in condition of "contracted granular" kidney. In birds it is nearly always chronic, about one-third of the number being of the contracted granular kidney type. A conjunction of climatic conditions with exposure would seem to be answerable for many of the cases in mammals, and 40 out of the 60 acute cases had lung lesions, from congestion to broncho-pneumonia.

9. In a Bay Duiker, the left kidney was converted into multiple cysts containing stones, and there was one large cyst in the right; there was also a hæmorrhagic cystitis.

10. The carcinomata were all visceral, and occurred in one Kangaroo and three Gazelles. In all the cases the initial growth was in the stomach, and there were atrophic changes in the sexual glands.

11. The sarcomata occurred in a Binturong (visceral), a Bear (kidneys), an Owl (heart), and a Sternothere (heart).

12. The diseases grouped under the term malaria were due in 31 instances to *Hæmoproteus danilewskyi* and in 6 instances to *Plasmodium præcox*.

12, 13, 14, 15. See the section on blood-parasites.

During the year the blood of every animal which died has been examined, with the result that parasites have been found in 140 cases; in 80 species for the first time.

They have been distributed as follows:—

Filariæ. In 3 mammals; in 2 for the first time.
34 birds; in 24 species for the first time.
2 reptiles.

Trypanosomes. In 11 birds; in 6 species for the first time.

Malaria. { *Hæmoproteus danilewskyi*. In 33 birds; in 15 species for the first time.
Plasmodium præcox. In 7 birds; in 6 species for the first time.

Leucocytozoon. In 1 bird for the first time.

Hæmogregarines. In 48 reptiles; in 15 species for the first time.

Intestinal organisms of Trichomonas type ... In 1 reptile for the first time.

The following Tables show the occurrence of the blood-parasites in detail:—

Blood-Parasites found in 1912.

Embryo Filariæ found in the blood of Mammals.

	Habitat.	Type.
Pinché Marmoset (*Leontocebus œdipus*)...	Colombia.	Long.
Found in the following for the first time:		
Clouded Tiger (*Felis nebulosa*)	Malay.	Long, thin, large capsule.
S. American Night-Mouse (*Nyctomys* sp. inc.).	C. America.	Short, thick capsule.

Embryo Filariæ found in the blood of Birds.

Black-throated Hangnest (*Icterus gularis*).	S. America.	Short, straight.
2 Blue Birds (*Sialia sialia*)	N. America.	Short, thick.
Whydah Bird (*Urobrachya albonotata*).	E. Africa.	Long.
Occipital Blue Pie (*Urocissa occipitalis*).	India.	Short, thick.
Green-billed Toucan (*Ramphastos dicolorus*).	Guiana.	Short, thick.
Lawes' Bird of Paradise (*Parotia lawesi*).	New Guinea.	Long, thick.
White-throated Jay Thrush (*Garrulax albigularis*).	India.	Long, striated.
Lanceolated Jay (*Garrulus lanceolatus*).	India.	Short, pointed.

Found in the following for the first time :

	Habitat.	Type.
Crested Black Bunting (*Melophus melanicterus*).	India.	Long, thick.
Green Cardinal (*Gubernatrix cristata*) .	S. America.	Short, pointed.
Gouldian Grass-Finch (*Poëphila gouldiæ*)	Australia.	Short.
Mynah (*Acridotheres tristis*)	India.	Long and thin.
Yellow Sparrow (*Passer luteus*).....	E. Africa.	Long.
Crossbill (*Loxia curvirostra*)	Europe.	Long.
Grey Thrasher (*Toxostoma cinereum*) ...	Lr. California.	Long.
White-bellied Thrush (*Turdus albiventris*).	Demerara.	Long, thick.
Red Jungle-Fowl (*Gallus gallus*)	Malay.	Short, thick.
2 Blue-crowned Hanging Parrakeets (*Loriculus galgulus*).	Malay.	Long, thick.
White-cheeked Coly (*Colius erythromelon*).	S. Africa.	Long, thick.
Rufous-tailed Pheasant (*Acomus erythrophthalmus*).	Malay.	Short, thick.
Woodhouse's Jay (*Aphelocoma woodhousei*).	N. America.	Long, striated.
Hermit Thrush (*Hylocichla guttata pallasi*).	N. America.	Long, thin.
Burrowing Owl (*Speotyto cunicularia hypogæa*).	C. America.	Short, thick.
Little Owl (*Athene noctua*)	S. Europe.	Short, thick.
Purple Grackle (*Quiscalus purpureus*)...	N. America.	Long, thick.
Mexican Jay (*Xanthura luxuosus*)	S. America.	Long, pointed, and with very large capsule.
Grey-headed Ouzel (*Merula castanea*) ...	India.	Short.
Rufous-necked Weaver-bird (*Hyphantornis textor*).	Gambia.	Very short, stout.
Green Bulbul (*Chloropsis aurifrons*) ...	India.	Long, thin.
Drongo (*Dissemurus paradiseus*)	India.	Short, thick.
Red-headed Weaver-bird (*Foudia madagascariensis*).	Madagascar.	Long.
Scops Owl (*Scops giu*)	N. Europe.	Long, striated.

Embryo Filariæ found in the blood of Reptiles.

Edible Frog (*Rana esculenta*)	S. Europe.	Short, thick.
Pine Snake (*Pituophis sayi*)	N. America.	Long.

Trypanosomes found in the blood of Birds.

Dial Bird (*Copsychus saularis*)	India.

Found in the following for the first time :

Blue Bird (*Sialia sialia*)	N. America.
Whydah Bird (*Urobrachya albonotata*).	E. Africa.
Gouldian Grass-Finch (*Poëphila gouldiæ*)	Australia.
2 Grey Thrashers (*Toxostoma cinereum*).	Lr. California.
4 Blue-crowned Hanging Parrakeets (*Loriculus galgulus*).	Malay.
Wandering Tree-Pie (*Dendrocitta vagabunda*).	India.

These were all of the ordinary type of bird Trypanosomes.

Hæmoproteus danilewskyi *found in the blood of Birds.*

	Habitat.	Type.
Yellow-winged Sugar-Bird (*Cœreba cyanea*).	S. America.	
11 Blue-crowned Hanging Parrakeets (*Loriculus galgulus*).	Malay.	
Cape Sparrow (*Passer arcuata*)	S. Africa.	
Crossbill (*Loxia curvirostra*)	Europe.	
Little Owl (*Athene noctua*)	Europe.	
Found in the following for the first time :—		
2 Pratincoles (*Glareola pratincola*).....	India.	
3 Silver-eared Mesias (*Mesia argentauris*).	India.	
De Philippi's Meadow-Starling (*Sturnella defilippi*).	Chili.	
Whydah Bird (*Penthetria laticauda*) ...	E. Africa.	
Jerdon's Accentor (*Tharrhaleus jerdoni*).	India.	
Banded Parrakeet (*Palæornis fasciatus*).	India.	
Crested Black Bunting (*Melophus melanicterus*).	India.	
Yellow-throated Sparrow (*Gymnorhis flavicollis*.	India.	
White-throated Jay-Thrush (*Garrulax albigularis*).	India.	
Yellow-headed Reed-bird (*Agelæus icterocephalus*).	Mexico.	
Rufous-necked Weaver-bird (*Hyphantornis textor*).	Gambia.	
Red-headed Weaver-bird (*Foudia madagascariensis*).	Madagascar.	
Wandering Tree-Pie (*Dendrocitta vagabunda*).	India.	
Swainson's Francolin (*Pternistes swainsoni*).	S. Africa.	
Red Jungle-Fowl (*Gallus gallus*)	Malay.	

Plasmodium præcox *found in the blood of Birds: in all for the first time.*

Grey-headed Bunting (*Emberiza fucata*).	India.
Crested Black Bunting (*Melophus melanicterus*).	India.
Raven (*Corvus corax*)	Europe.
2 Crossbills (*Loxia curvirostra*)	Europe.
Pied Bush-Chat (*Pratincola caprata*)...	India.
Grey Thrasher (*Toxostoma cinereum*) ...	Lr. California.

Leucocytozoon found in the blood of the following Bird for the first time.

Scops Owl (*Scops giu*)	N. Europe.

Hæmogregarines found in the blood of Reptiles.

4 Common Boas (*Boa constrictor*)	S. America.	Long, host cells enlarged.
2 Indian Pythons (*Python molurus*) ...	India.	Medium, cells deformed.

	Habitat.	Type.
3 King Snakes (*Coronella getula*)	N. America.	Small, short.
Teguexin (*Tupinambis teguexin*)	S. America.	Large, granular cells enlarged.
Eyed Lizard (*Lacerta ocellata*)	S. Europe.	Long, thin, host-cells enlarged.
4 Dark Green Snakes (*Zamenis gemonensis*).	S. Europe.	Small, host-cells enlarged.
Russell's Viper (*Vipera russelli*)	India.	Long.
2 Rat-Snakes (*Zamenis mucosus*)	India.	Medium sized.
Indian Cobra (*Naia tripudians*)	India.	Long.
Tuberculated Iguana (*Iguana tuberculata*).	S. America.	Short.
Indian Eryx (*Eryx johni*)	India.	Long.
4 Diamond Rattlesnakes (*Crotalus atrox*).	N. America.	Large, host-cells enlarged.
2 Pine Snakes (*Pituophis sayi*)	N. America.	Long, cells enlarged.
Vivaceous Snake (*Tarbophis fallax*) ...	S. Europe.	Medium.
Green Mamba (*Dendraspis viridis*)	W. Africa.	Large.
European Pond-Tortoise (*Emys orbicularis*).	S. Europe.	Short, thick.
Long-nosed Viper (*Vipera ammodytes*) .	S. Europe.	Large.
Found in the following for the first time :—		
Robust Lizard (*Gerrhosaurus nigrolineatus*).	Cape Colony.	Large, granular, host-cells enlarged.
Angulated Tortoise (*Testudo angulata*) .	S. Africa.	Large, irregular.
Schott's Snake (*Philodryas schotti*)	S. America.	Small, short.
Copper-headed Viper (*Ancistrodon contortrix*).	Texas.	Long; snake had been 12 years in Gardens.
Common Krait (*Bungarus candidus*) ...	India.	Short and long.
Hamadryad (*Naia bungarus*)	India.	Large, stout.
Calabar Snake (*Calabaria reinhardti*) ...	W. Africa.	Medium.
Blood-stained Terrapin (*Cinosternum cruentatum*).	C. America.	Long.
Indian River-Snake (*Tropidonotus piscator*).	India.	Long, thick.
Baska Water-Tortoise (*Batagur baska*) .	Perak.	Stout.
2 Phayre's Tortoises (*Testudo emys*)	Malay.	Long, cells enlarged.
2 Thick-necked Tree-Boas (*Epicrates cenchris*).	Trinidad.	Large, cells enlarged.
Carpet-Viper (*Echis carinatus*)	N. Africa.	Long.
Water-Viper (*Ancistrodon piscivorus*)...	N. America.	Thick, cells enlarged.
Amboina Box-Tortoise (*Cyclemys amboinensis*).	Malay.	Short, thick.

Intestinal Organisms found in the blood of Reptiles.

Found for the first time in the following :—		
Amboina Box-Tortoise (*Cyclemys amboinensis*).	Malay.	Trichomonas.